

WHAT IS CLAIMED IS:

1. An etching solution containing at least hydrofluoric acid, nitric acid and hexafluorosilicic acid, the concentration of the hexafluorosilicic acid being not less than 10% by weight based on the weight of the etching solution.

2. An etching solution according to claim 1, wherein the concentration of the hexafluorosilicic acid is 15 to 40% by weight based on the weight of the etching solution.

3. An etching solution according to claim 1, wherein the concentration of the hydrofluoric acid is 1 to 20% by weight based on the weight of the etching solution.

4. An etching solution according to claim 1, wherein the concentration of the nitric acid is 20 to 60% by weight based on the weight of the etching solution.

5. An etching solution according to claim 1, further comprising acetic acid.

6. An etching solution according to claim 5, wherein the concentration of the acetic acid is 0.01 to 5% by weight based on the weight of the etching solution.

7. An etching solution according to claim 1, which is used for etching a silicon substrate.

8. A process for producing an etching solution containing hydrofluoric acid, nitric acid and hexafluorosilicic acid by reacting hydrofluoric acid, nitric acid and a silicon compound with each other, comprising:

using a hydrogen fluoride gas as the hydrofluoric acid or fuming nitric acid as the nitric acid; and

reacting the hydrofluoric acid or the nitric acid with the silicon compound.

9. A process according to claim 8, wherein a hydrogen fluoride gas is used as the hydrofluoric acid, and an aqueous nitric acid solution having a concentration of not less than 70% by weight is used as the nitric acid.

10. A process for etching a silicon substrate, comprising:

subjecting a silicon substrate to etching treatment using an etching solution comprising at least hydrofluoric acid, nitric acid and hexafluorosilicic acid;

after the etching treatment, subjecting the etching solution to quantitative analysis to determine a composition of the etching solution;

controlling the concentration of the etching solution after the etching treatment on the basis of the results of the quantitative analysis such that the concentrations of hydrofluoric acid, nitric acid and hexafluorosilicic acid are 1 to 20% by weight based on the weight of the etching solution, 20 to 60% by weight based on the weight of the etching

solution and not less than 10% by weight based on the weight of the etching solution, respectively; and

etching the silicon substrate using the resultant solution as an etching solution.

11. A process according to claim 10, wherein the concentration of the etching solution after the etching treatment is controlled by adding the respective components each having a concentration lower than the predetermined concentration thereto.

12. A process according to claim 10, wherein the concentration of the etching solution after the etching treatment is controlled by taking out a part of the etching solution, removing the hexafluorosilicic acid from the etching solution taken-out, and adding the resultant solution to the etching solution after the etching treatment.

13. A process for producing a semiconductor device, comprising:

etching silicon, a silicon compound film or silicon and a silicon compound of the semiconductor device mainly constituted by a silicon substrate or a silicon thin film, with an etching solution containing hydrofluoric acid, nitric acid and hexafluorosilicic acid, the concentration of the hexafluorosilicic acid contained in the etching solution being not less than 10% by weight based on the weight of the etching solution.